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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,567	03/29/2007	Chikara Ohki	2006_0503A	9262
513 7590 12/18/2009 WENDEROTH, LIND & PONACK, L.L.P. 1030 15th Street, N.W., Suite 400 East Washington, DC 20005-1503				
EXAMINER VELASQUEZ, VANESSA T				
ART UNIT		PAPER NUMBER		
1793				
MAIL DATE		DELIVERY MODE		
12/18/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/574,567

Applicant(s)

OHKI ET AL.

Examiner

Vanessa Velasquez

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4 and 5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4 and 5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/GS/US)
Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on December 29, 2008 and September 24, 2009 have been entered.

Status of Claims

Claim 3 is canceled. Claim 5 is newly added. Currently, claims 1, 2, 4, and 5 are pending and presented for examination.

Status of Previous Objection to the Specification

The previous objection to the specification is withdrawn in view of Applicant's remarks.

Status of Previous Objection to the Claims

The previous objection to claim 1 is withdrawn in view of the amendment to the claim.

Status of Previous Rejection of the Claims Under 35 USC § 112

The previous rejection of claim 1 under the second paragraph under 35 U.S.C. 112 is withdrawn in view of amendments to the claim.

Claim Rejections - 35 USC § 112, First Paragraph

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 5 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. There is no support in the original specification stating that the concentration of NH_3 before decomposition affects the content of nitrogen in the steel.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 2, 4, and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki (US 2003/0123769 A1) in view of Okita et al. (US 5,672,014), and further in view of Higgins ("The Surface Hardening of Steels," Ch. 19, *Engineering Metallurgy, Part I: Applied Physical Metallurgy*).

Regarding claims 1, 4, and 5, Ohki teaches a steel comprising an austenitic microstructure (para. [0031]). The grains of the austenite have a JIS grain size number higher than 10 (para. [0031]). The steel is subjected to a carbonitriding heat treatment

that causes nitrogen to diffuse into the surface layer, thereby producing a surface saturated with nitrogen (para. [0011], [0060]). The steel may be utilized in the manufacture of a roller bearing comprising an outer ring, inner ring, and rolling elements (para. [0053]). The composition of the steel comprises the following elements in percent by weight (para. [0024], [0025], [0055]):

Element	Claim 1	Ohki et al.
C	0.6 - 1.3	0.6 - 1.2
Si	0.3 - 3.0	0.15 - 1.1
Mn	0.2 - 1.5	0.3 - 1.5
P	0 - 0.03	0 - 0.1
S	0 - 0.03	0 - 0.1
Cr	0.3 - 5.0	0 - 2.0
Ni	0.1 - 3.0	silent
Al	0 - 0.050	0 - 0.1
Ti	0 - 0.003, required	silent
O	0 - 0.0015	0 - 0.1
N	0 - 0.015	0 - 0.1
Fe + impurities	balance	balance

The overlap between the ranges taught in the prior art and the claimed ranges is sufficient to establish a *prima facie* case of obviousness (MPEP § 2144.05 Section I). Ohki does not teach the presence of nickel. Ohki is further unclear as to whether titanium is present in any amount.

U.S. Patent No. 5,672,014 issued to Okita et al. is drawn to a carbonitrided steel for the manufacture of roller bearings. The steel contains the same main alloying elements as Ohki with ranges that have substantial overlap (see abstract).

With regard to nickel, Okita et al. teach that adding nickel in amounts of up to 2.0 wt.% enhances the toughness of the steel (col. 15, lines 45-51). Therefore, it would

have been obvious to one of ordinary skill in the art to have added nickel to the steel composition of Ohki in order to improve its hardness.

With regard to titanium, Okita et al. teach that titanium is considered an impurity in bearing steels (col. 10, lines 51-57). The steel of Ohki is a bearing steel. Thus, the steel of Ohki would be expected to contain impurities, such as titanium, that are common to bearing steels. It should be noted that although Okita et al. provide strong motivation to eliminate impurities from the steel because of its negative effect of shortening the life of the bearing (col. 10, lines 52-59), its complete or substantially complete removal is not economically practical given the large costs involved with the removal process (col. 10, lines 59-64). Okita et al. further teach that hardness and retained austenite are of much greater concern than suppressing impurities. Therefore, because the efforts were not made to completely or substantially completely remove impurities from the steel, one would expect impurities, such as titanium, sulfur, and oxygen, to remain therein in very small impurity-level quantities. Moreover, given the motivation to prevent high manufacturing costs, Ohki would not be motivated to completely or substantially completely remove impurities contained therein. Therefore, one of ordinary skill in the art would expect the impurities common to bearing steels to also remain therein because of the burdensome costs of removing them.

Ohki does not explicitly teach a nitrogen-enriched layer having a content of 0.1% to 0.7% or that said content is measured at a depth of 50 microns. However, these limitations do not patentably distinguish the claimed invention from the prior art for at least the following reasons: Ohki teaches a carbonitriding process that is substantially

identical to that disclosed in the present application (compare para. [0065] of Ohki with pp. 12-13 of the present specification). In addition, Higgins provides evidence demonstrating that it is well known to those of ordinary skill in the metallurgical arts to manipulate factors important to the carbonitriding process, such as temperature and concentration of ammonia, in order to achieve a desired nitrogen content in the surface of carbonitrided steels. On page 476 of Higgins, it is taught that the concentration of ammonia and the temperature under which carbonitriding occurs play important roles in determining how much carbon and nitrogen are dissolved in a body of steel, and that the amount of nitrogen embedded in the surface of steel affects the hardness of the steel part (para. 19.46). Therefore, it would have been obvious to one of ordinary skill in the art to control the ammonia concentration and temperature of the carbonitriding process in the method of Ohki in order to achieve a desired nitrogen content, and consequently hardness, in the steel of the roller bearing of Ohki. The teachings of Okita et al. further identify an optimum surface nitrogen concentration of 0.05-0.9 wt.%, as this quantity improves surface hardness and wear resistance (col. 7, lines 20-31), providing the motivation for one of ordinary skill in the art to limit the nitrogen surface concentration to this range. Thus, in light of the identical heat treatment pattern of Ohki and known carbonitriding variables disclosed by Higgins, one of ordinary skill in the art could clearly arrive at the claimed invention.

Regarding claim 2, Ohki is silent as to the vanadium and molybdenum content. Okita et al. teach that molybdenum and vanadium are beneficial because they encourage the formation of surface carbides and nitrides, which enhance wear

resistance and rolling fatigue life (col. 15, lines 25-45). Suitable amounts do not exceed 3.0 wt.% for molybdenum and 2.0 wt.% for vanadium.

Response to Arguments

Applicant's arguments have been considered but are moot in view of the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is 571-270-3587. The examiner can normally be reached on Monday-Friday 9:00 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Vanessa Velasquez/

Examiner, Art Unit 1793

/Scott Kastler/

Primary Examiner, Art Unit 1793